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10/598,502	09/01/2006	Yuichiro Nakamura	OGOSH60USA	6549

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EXAMINER	
SHEVIN, MARK L	

ART UNIT	PAPER NUMBER
1793	

NOTIFICATION DATE	DELIVERY MODE
06/17/2010	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/598,502	NAKAMURA ET AL.	
	Examiner	Art Unit	
	MARK L. SHEVIN	1793	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *22 March 2010*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,4 and 11-17* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1, 4 and 11-17* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Status of Claims

1. Claims 1, 4, and 11-17, filed March 22nd, 2010, are currently under examination. Claims 1, 4, 13, and 17 are amended and claims 2-3 and 5-10 are canceled.

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claim Rejections - 35 USC § 103

2. **Claims 1, 4, and 12-17** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Bartholomeusz** (US 6,521,062) in view of **Yamakoshi** (US 6,153,315).

Regarding claim 1, Bartholomeusz is drawn to the production of cobalt-base alloy sputtering targets (claims 1 and 12 and 13 and col. 2, lines 50-58) with primary elemental additions of Cr, Pt, Ni of 0 – 30 at% and secondary elemental additions such as Ta, B, Nb, Sm, Fe, Si, Zr, W, Mo, V, Hf, and Ti of 0 – 30 at%, such as alloys comprising Co, Cr, Pt, and B (claims 7, 8, 17, 18, and 19).

Such cobalt-base alloys can be very difficult to roll if the concentration of limited solid-solubility elements is excessive (col. 1, lines 19-30). As more Ta and B are added to the Co-Cr-Pt-B-Ta matrix studied by Bartholomeusz, the intermetallic precipitates became less dispersed and more continuous as expressed by the metric (continuity) of volume percent discontinuous intermetallic phases divided by the number of free nodes of these phases (col. 3, lines 58-65).

Beyond a certain continuity, continuous and brittle intermetallic phase networks form leading to fracturing during hot-rolling due to ready crack propagation along the intermetallic network (col. 3, line 65 to col. 4, line 4).

Bartholomeusz solves this problem of brittle interconnected intermetallics by casting and rolling to produce grain sizes of about 20 μm and precipitate sizes of about 1 μm (col. 4, lines 4-13). His process is embodied in claim 1 and col. 5, line 60 to col. 6, line 5 and yields average product grain sizes of less than 100 μm, average product precipitate size of less than 50 μm, with no significant through thickness grain-size or precipitate size gradient, theoretical density, high pass through flux of greater than 20%, and substantially homogenous microstructural (col. 6, lines 14-25 and claim 1).

Batholomeusz discloses sputtering targets (claims 1 and 12 and 13 and col. 2, lines 50-58) of at least Co, Cr, Pt, and B (claims 7, 8, 17, 18, and 19) having a target surface prepared by melting, casting, and rolling (col. 6, lines 14-25 and claim 1) in which intermetallic compounds or other substances without ductility exist (col. 3, line 65 to col. 4, line 4 and col. 4, lines 4-13.

With respect to the average particle diameter being at least 0.5 μm to 50 μm, Bartholomeusz teaches that the average product precipitate size produced by his method is less than 50 μm (col. 6, lines 14-25), which overlaps the claimed range.

However Bartholomeusz is silent with respect to the presence of oxides, carbides, and carbonitrides, the matrix being a highly ductile phase, the volume percentage of precipitates of 1% to 50%, the Vickers hardnesses of the matrix and other substances without ductility and the attendant hardness difference of the two.

From the instant specification, the instant target with the features of oxides, carbides, and carbonitrides, the matrix being a highly ductile phase, the volume percentage of precipitates of 1% to 50%, the Vickers hardnesses of the matrix and other substances without ductility and the attendant hardness difference of the two is manufactured by dissolution and rolling (p. 7, lines 15-20, p. 9, lines 1-6 and 17-22) - (cutting with a lathe and latter polishing do not form the claimed sputtering target precipitate structure of claim 1). Dissolution is considered to be casting.

Bartholomeusz's sputtering targets are of a substantially similar composition (comprising Co, Cr, Pt, and B) and are produced by a substantially similar process in being cast (col. 5, lines 60-65) and then rolled (col. 6, lines 3-5).

Thus, one of ordinary skill in sputtering target manufacturing would have reasonably expected that Bartholomeusz produces Co-Cr-Pt-B sputtering targets that meet the claimed limitations of claim 1 regarding the presence of oxides, carbides, and carbonitrides, the matrix being a highly ductile phase, the volume percentage of precipitates of 1% to 50%, the Vickers hardnesses of the matrix and other substances without ductility and the attendant hardness difference of the two because Bartholomeusz's sputtering targets are of a substantially similar composition (comprising Co, Cr, Pt, and B) and are produced by a substantially similar process in being cast (col. 5, lines 60-65) and then rolled (col. 6, lines 3-5).

It would have been obvious to one of ordinary skill in sputtering target manufacturing, at the time of the invention, to select any portion of the claimed range of average precipitate size, including the claimed range, from the overlapping range

disclosed in Bartholomeusz because Bartholomeusz finds that the prior art composition in the entire disclosed range has a suitable utility and the normal desire of scientists or artisans to improve upon what is already generally known provides the motivation to determine where in a disclosed set of percentage ranges is the optimum combination of percentages."); *In re Hoeschele*, 406 F.2d 1403, 160 USPQ 809 (CCPA 1969). From MPEP § 2144.05: In the case where the claimed ranges "overlap or lie inside ranges disclosed by the prior art" a *prima facie* case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976); *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir. 1990).

With respect to the amendment to claim 1 adding "...casting...cutting and polishing", Bartholomeusz discloses casting (col .4, lines 50-67, col. 5, lines 5-10) while the claimed processing steps of cutting and polishing as not considered to yield a patentable distinction product from that disclosed by Batholomeusz in terms of final structure. (see MPEP 2113).

However, with respect to the limitation of "wherein defects of 10 μm or more resulting from machine work do not exist", Batholomeusz discloses machining work of cutting the sputtering target from rolled plate (Abstract, claims 12 and 13) which would be considered to create defects of the type barred by instant product claim 1.

Yamakoshi, drawn to a method of manufacturing a sputtering target which provides excellent uniformity in film thickness and low incidence of occurrence of nodules and particles (col. 1, lines 5-10), teaches that variation in film thickness and the production of particles and nodules are all attributable to conditions of the target surface

(col. 1, lines 23-40) and it is necessary to reduce the thickness of a surface damage layer produced by machining to 15 μm or less and the surface roughness to 0.2 μm or less by precision machining of the surface with a diamond turning tool followed by polishing (col. 2, lines 1-21, col. 4, line 66 - col. 5, line 2) to reduce sputtered films more even and to reduce the number of nodules and particles released during sputtering (col. 2, lines 45-56).

Thus, it would have been to one of ordinary skill in the art, the time of the invention, to remove the surface damaged layers resulting from the cutting process of Batholomeusz in order to reduce both the surface roughness and the thickness of surface damaged layers to achieve more even sputtered films and reduced particles generated during sputtering (col. 2, lines 45-56).

With respect to "defects of 10 μm or more", the process of reducing the thickness of surface damaged layers to 15 μm thickness or less (col. 4, lines 51-58) is considered to overlap the claimed range and it would have been obvious to one of ordinary skill in the art, to select any portion of the claimed range, including the claimed range, from the overlapping rangedisclosed in Yamakoshi because Yamakoshi finds that the prior art final surface damage layer thickness in the entire disclosed range has a suitable utility and the normal desire of scientists or artisans to improve upon what is already generally known provides the motivation to determine where in a disclosed set of percentage ranges is the optimum combination of percentages and in the case where the claimed ranges "overlap or lie inside ranges disclosed by the prior art" a *prima facie* case of obviousness exists. Furthermore, where the general conditions of a claim are disclosed

in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation (MPEP 2144.05, section I, para 1 and section II, A, para 1)

Regarding claims 4 and 17, Yamakoshi disclosed machining (turning in a lathe) and subsequent polishing of sputtering targets (but did not disclose the amount of material removed during machining or the amount of material removed during polishing.

With respect to the amount of material removed during the "cutting" step, a skilled machinist would be able to adjust the area removed from a rough sputtering target depending on the desired target shape, size, surface profile, and surface roughness and thus the amount of material removed during such machining/cutting step would be considered to be a design choice based on the shape of the sputtering target or a result of routine experiment dependent on the desired surface damage layer thickness as disclosed by Yamakoshi.

With respect to polishing a thickness of 1 μm to 50 μm from the target surface, Yamakoshi disclosed that further polishing after machining reduced particle generation during sputtering (col. 10, lines 61-67) and as the surface damaged layers (to be eroded – claim 2) were taught to be desirably reduced to 50 μm or less, preferably 15 μm or less (col. 2, lines 1-21), thus one of ordinary skill in the art would have been motivated to polish a sufficient thickness of material so as to reduce the thickness of surface damaged material to 50 μm or less, preferably 15 μm or less, yielding a thickness of material removed which overlaps the claimed range.

Regarding claim 12, Yamakoshi discloses the use of a diamond turning tool (col. 16, lines 33-39), which is considered to be a lathe turning tool.

Regarding claims 13-16, these claims are rejected for the same reasons as stated for claim 1 above.

With respect to said surface providing "...a flat and smooth target face without undulation", the prior art of Bartholomeusz would similarly be expected to have a "flat and smooth target face without undulation" as Bartholomeusz is produced by a substantially similar process including casting and rolling and such rolling would be expected to give a flat and smooth surface without undulation. Similarly, the lathe machining process of Yamakoshi would similarly be expected to yield a flat surface without undulation as Yamakoshi sought to minimize surface roughness.

With respect to the amendment to claim 13 adding "...casting...cutting and polishing", this amendment is does not overcome the rejections over Bartholomeusz for the same reasons as stated for the rejection of claim 1 above.

3. **Claim 11** is rejected under 35 U.S.C. 103(a) as being unpatentable over **Bartholomeusz** in view of **Yamakoshi** as applied to claims 1,4, and 12-17 above, in further view of **Tamura** (US 6,024,852).

The disclosures of Bartholomeusz and Yamakoshi were discussed above, however neither reference disclosed that polishing should be performed with sandpaper or grindstone having an abrasive grain size of #80 to #400.

Regarding claim 11, Tamura discloses the production of a sputtering target which generates a reduced quantity of particles during sputtering by having a mean roughness

of 0.01 μm or below (col. 1, lines 32-55) by polishing to a mirror finish by lapping starting with a slurry of #300 alumina (col. 3, lines 1-15).

Thus it would have been obvious to one of ordinary skill in the art, at the time of the invention, to have carried out the method of Bartholomeusz in view of Yamakoshi by polishing with at least a step utilizing a rough abrasive in the range of #80 to #400 as Tamura disclosed starting with such a rough abrasive grain to achieve a mirror polish designed to minimize particle production, which is one of the same goals espoused by Yamakoshi.

Although lapping is performed with "sandpaper or a grindstone", one of ordinary skill in the art would have motivated to modify the lapping process of Tamura to use sandpaper or a grindstone depending on the shape of the sputtering target surface desired.

Response to Applicant's Arguments:

4. Applicants' arguments (p. 7 to p. 9, para 2) are moot in view of the new grounds of rejection applied.

Applicants assert (pp. 10, para 3 to p. 11, para 2) that Yamakoshi is limited to Ti, Ta or Cu single layer sputtering targets. In response, Yamakoshi does not state that his invention is limited to such sputtering targets and his claim 1 applied to any sputtering target composition. Furthermore, MPEP 2123 section II states: "disclosed examples and preferred embodiments do not constitute a teaching away from a broader disclosure or nonpreferred embodiments. "

Applicants assert (p. 11, para 2) that Yamakoshi is only able to achieve his disclosed benefits by using diamond precision cutting. In response, Applicants' instant claims do not exclude cutting using a lathe with a diamond turning tool.

Conclusion

-- Claims 1, 4, and 11-17 (All pending) are rejected
-- No claims are allowed

The rejections above rely on the references for all the teachings expressed in the text of the references and/or one of ordinary skill in the metallurgical art would have reasonably understood or implied from the texts of the references. To emphasize certain aspects of the prior art, only specific portions of the texts have been pointed out. Each reference as a whole should be reviewed in responding to the rejection, since other sections of the same reference and/or various combinations of the cited references may be relied on in future rejections in view of amendments.

All recited limitations in the instant claims have been met by the rejections as set forth above. Applicant is reminded that when amendment and/or revision is required, applicant should therefore specifically point out the support for any amendments made to the disclosure. See 37 C.F.R. § 1.121; 37 C.F.R. Part §41.37 (c)(1)(v); MPEP §714.02; and MPEP §2411.01(B).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mark L. Shevin whose telephone number is (571) 270-3588 and fax number is (571) 270-4588. The examiner can normally be reached on Monday - Friday, 8:30 AM - 5:00 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy V. King can be reached on (571) 272-1244. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Mark L. Shevin/

June 12th, 2010
10-598,502

/George Wyszomierski/
Primary Examiner
Art Unit 1793